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29 July 2004

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/25677

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : E21B 23/00; F16L 25/00  
US CL : 166/207,380; 285/333

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 166/207,380,206,313,381,242.6; 285/333,53; 403/179,273

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
Please See Continuation Sheet

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A, P	US 2003/0067166 A1 (SIVLEY, IV) 10 April 2003 (10.04.2003), whole document.	1-4
A	US 5,314,014 A (TUCKER) 24 May 1994 (24.05.1994), whole document.	1-4
A	US 4,614,233 A (MENARD) 30 September 1986 (30.09.1986), whole document.	1-4
A	US 3,520,049 A (LYSENKO et al) 14 July 1970 (14.07.1970), whole document.	1-4

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

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12 December 2003 (12.12.2003)

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**INTERNATIONAL SEARCH REPORT**

PCT/US03/25677

**Continuation of B. FIELDS SEARCHED Item 3:**  
JPO, EPO, Derwent

Terms: sleeve, tubular, expansion/expand, magnetic, impulse/impulsive

**(19) World Intellectual Property  
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**REMARKS:**

**PCT**

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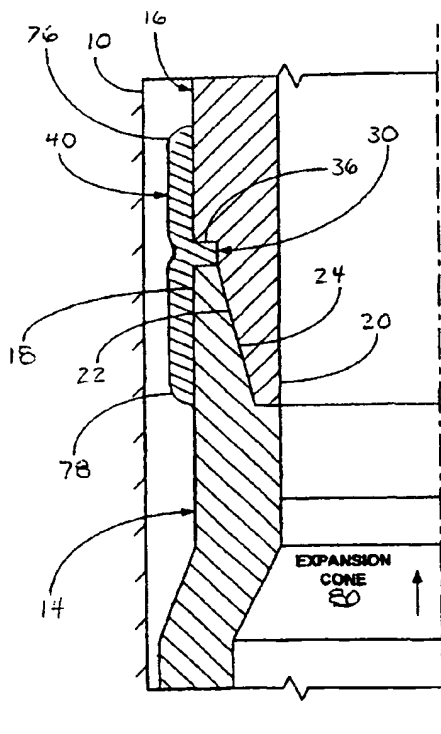
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— of inventorship (Rule 4.17(iv)) for US only

**Declaration under Rule 4.17:**

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*[Continued on next page]*

(54) Title: MAGNETIC IMPULSE APPLIED SLEEVE METHOD OF FORMING A WELLBORE CASING



(57) **Abstract:** A method of forming a wellbore casing within a borehole (10) that traverses a subterranean formation includes the steps of assembling a tubular liner by coupling a threaded portion (24) of a first tubular member (16) to a threaded portion (22) of a second tubular member (14) and coupling a tubular sleeve (40) to the threaded portions (22,24) of the first (16) and second (14) tubular members. The method further includes positioning the wellbore casing within the borehole (10). The step of coupling the tubular sleeve (40) through the threaded portions (22,24) of the first (16) and second (14) tubular members includes applying impulsive magnetic energy to the tubular sleeve (40).

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**AMENDED CLAIMS**

[received by the International Bureau on 20 July 2004 (20.07.04);  
original claims 1-4 have been amended; claims 5-16 have been added]

**Claims**

What is claimed is:

1. A method of forming a wellbore casing within a borehole that traverses a subterranean formation, comprising:
  - assembling a tubular liner assembly by a process comprising:
    - coupling a threaded portion of a first tubular member to the threaded portion of a second tubular member; and
    - coupling a tubular sleeve to the threaded portions of the first and second tubular members;
  - positioning the tubular liner assembly within the borehole; and
  - radially expanding and plastically deforming the tubular liner assembly within the borehole;
  - wherein coupling the tubular sleeve to the threaded portions of the first and second tubular members comprises:
    - applying impulsive magnetic energy to the tubular sleeve.
2. A method of forming a coupling between metallic tubular members comprising a process comprising:
  - forming a female coupling portion on a first tubular member;
  - forming a male coupling portion on a second tubular member;
  - forming at least one raised ridge ring between the male and female coupling portions;
  - coupling the female coupling portion of the first tubular member and the male portion of the second tubular member including pressing the coupling portions together in surface-to-surface contact;
  - applying a tubular sleeve to exterior surfaces of the pressed together coupling portions of the first and second tubular members using a magnetic impulse generator; and
  - radially expanding and plastically deforming the coupling between the tubular members with the tubular sleeve applied.
3. The method of claim 2, wherein coupling the male and female coupling portions together further comprises forming at least one ridge ring interposed between the coupling portions to increase the surface-to-surface stress, thereby facilitating sealing between the first and second tubular members.

4. The method of claim 2 wherein coupling the male and female coupling portions together further comprises forming a layer of material softer than the metallic tubular members interposed between the coupling portions to increase the surface-to-surface stress, thereby facilitating sealing between the first and second tubular members.
5. A method of forming a wellbore casing within a borehole that traverses a subterranean formation, comprising:
- assembling a tubular liner assembly by a process comprising:
    - coupling an end of a first tubular member to an end of a second tubular member; and
    - coupling a tubular sleeve to the ends of the first and second tubular members;
  - positioning the tubular liner assembly within the borehole; and
  - radially expanding and plastically deforming the tubular liner assembly within the borehole;
- wherein coupling the tubular sleeve to the ends of the first and second tubular members comprises:
- applying impulsive magnetic energy to the tubular sleeve.
6. A method of forming a coupling between metallic tubular members comprising a process comprising the steps of:
- coupling the ends of first and second tubular members;
  - applying a tubular sleeve to the ends of the first and second tubular members using magnetic energy; and
  - radially expanding and plastically deforming the coupling between the first and second tubular members with the tubular sleeve applied.
7. The method of claim 6, wherein coupling the ends of the first and second tubular members comprises increasing the surface-to-surface stress between the first and second tubular members.
8. The method of claim 6, wherein coupling the ends of the first and second tubular members comprises forming a layer of material softer than the ends of the first and second tubular members interposed between the ends of the first and second tubular members.
9. A system for forming a wellbore casing within a borehole that traverses a subterranean formation, comprising:
- means for assembling a tubular liner assembly comprising:



means for coupling a threaded portion of a first tubular member to the threaded portion of a second tubular member; and  
means for coupling a tubular sleeve to the threaded portions of the first and second tubular members;

means for positioning the tubular liner assembly within the borehole; and  
means for radially expanding and plastically deforming the tubular liner assembly within the borehole;

wherein means for coupling the tubular sleeve to the threaded portions of the first and second tubular members comprises:

means for applying impulsive magnetic energy to the tubular sleeve.

10. A system for forming a coupling between metallic tubular members comprising:

means for forming a female coupling portion on a first tubular member;  
means for forming a male coupling portion on a second tubular member;  
means for forming at least one raised ridge ring between the male and female coupling portions;

means for coupling the female coupling portion of the first tubular member and the male portion of the second tubular member including pressing the coupling portions together in surface-to-surface contact;

means for applying a tubular sleeve to exterior surfaces of the pressed together coupling portions of the first and second tubular members using magnetic energy; and

means for radially expanding and plastically deforming the coupling between the tubular members with the tubular sleeve applied.

11. The system claim 10, wherein means for coupling the male and female coupling portions together further comprises means for forming at least one ridge ring interposed between the coupling portions to increase the surface-to-surface stress.

12. The system of claim 10, wherein means for coupling the male and female coupling portions together further comprises means for forming a layer of material softer than the metallic tubular members interposed between the coupling portions to increase the surface-to-surface stress, thereby facilitating sealing between the first and second tubular members.

13. A system for forming a wellbore casing within a borehole that traverses a subterranean formation, comprising:

means for assembling a tubular liner assembly by a process comprising:

means for coupling an end of a first tubular member to an end of a second tubular member; and

means for coupling a tubular sleeve to the ends of the first and second tubular members;

means for positioning the tubular liner assembly within the borehole; and

means for radially expanding and plastically deforming the tubular liner assembly within the borehole;

wherein means for coupling the tubular sleeve to the ends of the first and second tubular members comprises:

applying impulsive magnetic energy to the tubular sleeve.

14. A system for forming a coupling between metallic tubular members comprising:
  - means for coupling the ends of first and second tubular members;
  - means for applying a tubular sleeve to the ends of the first and second tubular members using magnetic energy; and
  - means for radially expanding and plastically deforming the coupling between the first and second tubular members with the tubular sleeve applied.
15. The system of claim 14, wherein means for coupling the ends of the first and second tubular members comprises means for increasing the surface-to-surface stress between the first and second tubular members.
16. The system of claim 14, wherein means for coupling the ends of the first and second tubular members comprises means for forming a layer of material softer than the ends of the first and second tubular members interposed between the ends of the first and second tubular members.

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